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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,035	08/29/2006	Susumu Noda	128698	5887
25944 7590 06/09/2008 OLIFF & BERRIDGE, PLC P.O. BOX 320850 ALEXANDRIA, VA 22320-4850				
EXAMINER				
HAGAN, SEAN P				
ART UNIT		PAPER NUMBER		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/591,035

Applicant(s)

NODA ET AL.

Examiner

SEAN HAGAN

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/ICE)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1 through 6 originally filed 29 August 2006. Claims 3 through 6 amended by amendment filed 29 August 2006. Claims 1 through 6 are pending in this application.

Response to Arguments

2. With respect to applicant's note that Noda et al. (Noda, JP Patent 2003-273455) was cited previously with the incorrect patent number, this is correct. The correct document number has been noted in the response submitted 19 February 2008 and is noted above.

3. Applicant's argument with respect to the rejection of claim 1 has been fully considered and is persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new rejection has been formulated.

4. Regarding argument that limitation "A plane shape of each modified refractive index area on a side opposite from the active layer is smaller than that on another side facing the active layer" is not recited explicitly in the prior art, further inspection reveals applicants to be correct in this matter. However, the purpose for the tapering of photonic crystal elements in Noda is to modify transmission and reflection characteristics. It is especially noted that the transmission characteristics desired in Noda would appear to be ill suited for a configuration wherein outcoupling occurs

through the photonic crystal layer. However, it is important to note that Noda reveals that transmission characteristics may be modified by adjusting the relation between the surface area of the side of the photonic crystal layer upon which light is incident and the surface area of the side of the photonic crystal layer opposite the active layer of the device. As such, it is determined that this relation is represented as a result effective variable. It would have been obvious to one of ordinary skill in the art at the time of invention to form the photonic crystals at the desired taper, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205, USPQ 215 (CCPA 1980).

5. Accordingly, all claims are addressed as follows:

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1 and 3 through 6 rejected under 35 U.S.C. 103(a) as being unpatentable over Deng et al. (Deng, US Pub. 2003/0235229) in view of Baba et al. (Baba, US Pub. 2005/0089075).

8. ***Regarding claim 1***, Deng discloses, "A two-dimensional photonic crystal having a plate-shaped body material in which a large number of modified refractive index areas whose refractive index differs from that of the body material are periodically arranged" (p. [0026]). "An active layer provided on one side of the two-dimensional photonic

crystal" (Fig. 4). Deng does not disclose, "A center of gravity of each modified refractive index area on the side facing the active layer is displaced from that on the side opposite from the active layer." Baba discloses, "A center of gravity of each modified refractive index area on the side facing the active layer is displaced from that on the side opposite from the active layer" (Fig. 7b). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Deng with the teachings of Baba. The design of photonic crystal layer so as to cause the center of gravity of each defect to be displaced on one surface relative to the other surface as taught by Baba would enhance the teachings of Deng by increasing the probability of light interaction and thus increase scattering loss of higher order mode light (Baba, p. [0100]).

9. The combination of Deng and Baba does not disclose, "A plane shape of each modified refractive index area on a side opposite from the active layer is smaller than that on another side facing the active layer." It would have been obvious to one of ordinary skill in the art at the time of invention to form the photonic crystals at the desired taper, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205, USPQ 215 (CCPA 1980).

10. **Regarding claim 3**, Deng does not disclose, "The shape of the modified refractive index area on the side facing the active layer is a triangle." "The shape of the modified refractive index area on the side opposite from the active layer is a triangle that is smaller than the aforementioned triangle." Baba discloses, "The shape of the

modified refractive index area on the side facing the active layer is a triangle" (Fig. 7a). "The shape of the modified refractive index area on the side opposite from the active layer is a triangle that is smaller than the aforementioned triangle" (Fig. 7a). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Deng with the teachings of Baba for the reasons given above regarding claim 1.

11. **Regarding claim 4**, Deng discloses, "The shape of the modified refractive index area on the side facing the active layer is a circle" (Fig. 1a).

12. The combination of Deng and Baba does not disclose, "The shape of the modified refractive index area on the side opposite from the active layer is a shape obtained by partially cutting the aforementioned circle." It would have been an obvious matter of design choice to appropriately design circular defects to taper in such a manner since applicant has not disclosed that this form of tapering, as opposed to tapering done for triangular defects, solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with triangular defects following the teachings of the independent claim.

13. **Regarding claim 5**, Deng discloses, "The modified refractive index areas are arranged in a square lattice pattern" (Fig. 1a).

14. **Regarding claim 6**, Deng discloses, "The modified refractive index area consists of holes or a member made of a material whose refractive index differs from that of the body material" (p. [0026]).

15. Claim 2 rejected under 35 U.S.C. 103(a) as being unpatentable over Deng in view of Baba and further in view of Noda.

16. **Regarding claim 2**, the combination of Deng and Baba does not disclose, "A cross-sectional shape of the modified refractive index area on a plane perpendicular to the body material has a step- like profile." Noda discloses, "A cross-sectional shape of the modified refractive index area on a plane perpendicular to the body material has a step- like profile" (Fig. 5c). It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of the combination of Deng and Baba with the teachings of Noda. The procedure by which a photonic crystal element of variable surface area is formed in a stepped manner would have been suitable for use in the combination of Deng and Baba. The selection of something based on its known suitability for its intended use has been held to support a prima facie case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Conclusion

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17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SEAN HAGAN whose telephone number is (571)270-1242. The examiner can normally be reached on Monday-Friday 7:30 - 5:00.

18. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun O. Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

19. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. H./

Examiner, Art Unit 2828

/Minsun Harvey/

Supervisory Patent Examiner, Art Unit 2828